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Psychiatric hospitalizations for affective disorders in Warsaw, Poland: Effect of season and intensity of sunlight

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ABSTRACT

The purpose of this study was to assess any associations between the number of hospitalizations for affective disorders, seasons of the year and the intensity of sunlight in Poland, a country with a very changeable climate and significant seasonal fluctuations.

We analyzed 2837 admissions with affective disorders hospitalized in the Institute of Psychiatry and Neurology in Warsaw, between 2002 and 2010 (mania, $n=380$, mixed episode, $n=131$, bipolar depression, $n=736$, recurrent depression, $n=681$, single depressive episode, $n=909$). For each diagnostic group admission time series were created and categorized into subgroups according to sex and age, and these were analyzed by means of the Autoregressive Integrated Moving Average (ARIMA) method. Regression models and correlations were used to assess the influence of the intensity of sunlight on the number of hospitalizations.

Most mania admissions were noted in spring/summer months and in midwinter, mixed episode—late spring and winter, and depression (bipolar, recurrent and single depressive episode)—spring and autumn months. The association between frequency of admissions and monthly hours of sunshine was observed in some age and sex subgroups of patients with bipolar disorder and single depressive episode. The results support the seasonality of admissions of patients with affective disorders.

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1. Introduction

The problem of a possible association between frequency of affective disorder episodes and the seasons is referred to very often in the literature. However, the methodology in these studies varies so much that it is often hard to quantify the published reports. In the measurement of frequency of affective episodes, various factors have been taken into account, such as the number of antidepressant prescriptions (Skegg et al., 1986), the number of people who visit outpatient clinics complaining about specific symptoms (Posternak and Zimmerman, 2002), phone survey results (Shin et al., 2005), the number of first-time hospital admissions resulting from affective disorders (Hallam et al., 2006) and finally-the total number of hospital admissions caused by affective disorders (Suhail and Cochrane, 1998). Additionally, authors have considered different variables such as patients' sex (Suhail and Cochrane, 1997), smoking habits (D'Mello and Flanagan, 1996) or polarity of affective disorders (Shin et al., 2005) which could have modified the results.

The most commonly reported finding is a rise in mania admissions in the spring and summer months (Hare and Walter, 1978; Myers and Davies, 1978; Mulder et al., 1990; Takei et al., 1992; Suhail and Cochrane, 1998; Lee et al., 2007; Amr and Volpe, 2012) and a drop during wintertime (Myers and Davies, 1978; Lee et al., 2007; Amr and Volpe, 2012). Another frequent finding is that winter (Modai et al., 1994; Suhail and Cochrane, 1998; Avasthi et al., 2001; Lee et al., 2007; Amr and Volpe, 2012), as well as spring and autumn (Eastwood and Stiasny, 1978; Frangos et al., 1980; Silverstone et al., 1995; Morken et al., 2002) are the seasons when depressive episodes appear more often. The studies on the seasonality of hospital admissions for mixed episodes are not numerous. The authors usually combine this group of diagnosis with mania. However, the results point to a peak of such admissions during the summer months (Whitney et al., 1999; Cassidy and Carroll, 2002), as well as in early spring (Lee et al., 2007). Also, different patterns of seasonality of admissions depending on the sex of bipolar patients have been reported (Kerr-Correa et al., 1998; Hallam et al., 2006). For example, Kerr-Correa et al., (1998) found in their study that the seasons influenced only manic episodes and only among women and mostly in the spring and summer. On the other hand, Hallam et al. (2006) pointed out that seasonal changes can flare up affective disorders (mainly bipolar

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disorder), especially among male patients. One can also find studies where no link has been found between the seasons and the frequency of admission of affective disorder patients to hospitals (Daniels et al., 2000).

An entirely different matter is the question of whether the number of hospital admissions really correlates with the frequency of flare ups in affective disorders. It seems that the answer to this question should, at least in part, be positive. For example Payne et al. (1994) in their study of several groups of psychiatric and somatic patients, only found a significant correlation between the number of hospital admissions and the number of actually ill patients in cases of depression and respiratory diseases. On the other hand, hospital admission rates could be modified by various factors. As Guaina et al. (2011) point out, better recognition of depression as well as earlier and more effective treatment lead to decrease in hospital admissions. In psychiatric care, hospital admission rate could be also affected by availability of alternative services such as, for example, dayhospitals (Jenkins, 1990).

Several lines of evidence suggest that the occurrence of affective disorder episodes is associated with climatic variables such as temperature, atmospheric pressure, rainfall, humidity, duration of the days or intensity of sunlight (Myers and Davies, 1978; Modai et al., 1994; Lee et al., 2002, 2007; Radua et al., 2010). There has been growing evidence that climatic factors, such as intensity of sunlight, play a significant role in hospitalization for bipolar disorder (Myers and Davies, 1978; Modai et al., 1994). Lee et al. (2007) found an association between bipolar disorder admissions and the monthly hours of sunshine. Moreover, Bauer et al. (2012) reported that sunlight may have an important influence on the age of onset of bipolar disorder. Unlike bipolar disorder, data regarding the influence of climatic variables on episodes of recurrent depression are scarce. However, one study reported that some clinical subtypes of unipolar depressive episodes were associated with climatic factors, that is, mainly with ambient temperature and sunlight (Radua et al., 2010).

One complication that makes drawing final conclusions harder is that only in a limited number of studies did authors take into account various potentially modifying factors such as age and gender. However, some results do indicate that females may have a different sensitivity to sunlight. For example, Lee et al. (2002) suggest that the influence of sunlight is most visible in young women with mania.

In this context the intensity of sunlight is very important in Poland due to its distinctive climate. The weather is very changeable and, therefore, consecutive seasons of the year may vary significantly in regards to the number of hours with direct sunlight.

The aim of this study was to examine the seasonal variations in hospital admissions of patients with bipolar disorder (manic, depressive and mixed episodes), recurrent depressive disorder and single depressive episode, as well as to assess any links between the monthly hours of sunshine and the number of hospitalizations related to these diagnoses. The age and sex of the subjects were also taken into account as potential variables.

2. Methods

2.1. Data concerning hospitalizations

The study was conducted in the Institute of Psychiatry and Neurology in Warsaw (IPiN). Data concerning the hospitalization of patients with depression and mania were obtained from the IPiN computer database. The following parameters were set to search through the database for affective disorder admissions: diagnoses-F31, F32 and F33 according to the International Classification of Diseases, version 10 (ICD-10), unit—admissions to twenty-four-hour units, age-over 18 years of age, period of time-between 1st of January 2002 and 31st of December 2010.

2.2. Climate and geographical position

Poland has a temperate climate, between continental and marine. Therefore, weather conditions are very changeable and there are significant fluctuations in the seasonal patterns. Defined by temperature range, four basic seasons can be distinguished. The Spring usually lasts from March until May/June, the summer from June to August (with average temperatures between 16.5 °C and 20 °C), the autumn lasts from September to November, and the winter from December to February (with average temperatures between −6 °C and 0 °C). Yearly average hours of sunshine range between 1400 and 1900 h. The highest amounts of direct sunlight usually occurs in June and July, whereas the lowest in December.

The county of Masovia, with Warsaw as its capital city, is situated at 52°15'N latitude 21°00'E longitude, with average altitude of 100 m above sea level. Being located in central-eastern Poland, its climate is typical for large parts of the country.

2.3. Meteorological data

The meteorological data were obtained from the Polish Institute of Meteorology and Water Management—National Research Institute. The data comes from Campbell–Stokes heliograph readings (which measures the amount of time when sun rays hit the surface of the Earth directly in hours) from a station in Masovian county. In our analysis we used monthly data including the total monthly hours of sunshine, from 2002–2010.

2.4. Subjects studied

In the analyzed period of time there were 3651 admissions to IPiN (corresponding to 2241 individuals) with the following diagnoses: bipolar disorder, single depressive episode and recurrent depressive disorder (F31, F32, F33 according to ICD-10).

Table 1
Summary statistics of affective disorders admissions to the Institute of Psychiatry and Neurology in Warsaw, Poland, 2002–2010

	Number of admissions *n* (%)			Monthly means of admisssions			
Diagnostic group	**Female**	**Male**	**Total**	**Min.**	**Max.**	**Mean**	**S.D.**
Bipolar disorder-manic episode	220 (57.9%)	160 (42.1%)	380 (13.4%)	0	9	3.52	1.67
Bipolar disorder—depressive episode	504 (68.5%)	232 (31.5%)	736 (25.9%)	1	14	6.81	2.9
Bipolar disorder—mixed episode	89 (67.9%)	42 (32.1%)	131 (4.6%)	0	4	1.21	0.99
Single depressive episode	583 (64.1%)	326 (35.9%)	909 (32.1%)	2	18	8.42	3.21
Recurrent depression	511 (75.0%)	170 (25.0%)	681 (24.0%)	2	13	6.3	2.51
Total	1907 (67.2%)	930 (32.8%)	2837 (100%)	5	58	26.26	11.28

Note: Mean age at admission for females 56.5 (± 15.9), for males 52.6 (± 15.8)

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